Complex Analysis Conference

Titles and Abstracts

Salah Baouendi (University of California, San Diego),
Local and global automorphism groups of CR manifolds.

Joaquim Bruna (Universitat Autonoma de Barcelona),
On translates of the Poisson kernel and zeros of harmonic functions.
Abstract: In the talk we will discuss what is known about the following problem:
For which functions f and discrete parameter sets E the E-translates of f span $L^1(\mathbb{R})$?

A characterization of possible sets E is known in terms of densities, while the description of the possible generators f is not. For a specified generator f, the "individual problem" consists in describing the E's such that the E-translates of f span. We will consider this individual problem for some cases, including the Gaussian and the Poisson kernel, and state equivalent formulations in terms of zero sets for holomorphic and harmonic functions.

Michael Christ (University of California - Berkeley),
Existence and nonuniqueness for the nonlinear Schrödinger equation.
Intense study of the Cauchy problems for various nonlinear evolution equations has produced theorems guaranteeing wellposedness (that is, existence, uniqueness, and continuous dependence of solutions on initial data) for nonsmooth initial data. One of the prototypical equations is the nonlinear Schrodinger equation. This talk will outline two somewhat eccentric contributions to this theory.

The first topic is an alternative proof of existence, in which the solution is formally expressed as a power series in the initial datum, in which the terms are multilinear operators of all orders. The terms of this series are indexed not by integers, but by certain trees, which are analogous to Feynman diagrams. Basic number theory, but no sophisticated harmonic analysis, come into play.

The second topic is a family of counterexamples, showing that generalized solutions of the Cauchy problem in certain function spaces need not be unique. The solutions in question are however weaker than weak.

The square root of minus one plays a big role, but otherwise there is, regrettably, no complex analysis in the talk.

John P. D'Angelo (University of Illinois, Urbana-Champaign),
Proper Holomorphic Mappings between Balls and CR Complexity.
Abstract: Walter Rudin posed the problem "What are the proper holomorphic mappings from the unit ball B_n to the unit ball B_N?". Franc Forstneric proved, when $n \geq 2$, and the mapping is sufficiently smooth at the boundary sphere, then a proper holomorphic mapping between balls is a rational mapping. In this talk I will describe the structure of the collection of proper holomorphic mappings from B_n (for fixed n at least 2) to B_N (for all N). One result is that almost anything is possible, even for rational examples, if N is large enough. After describing this result and related matters, I will explain how this problem provides the simplest case of a kind of CR Complexity Theory.

Sergey Ivashkovich (Universite de Lille, France),

On a topological version of a Levi-type extension theorem.

László Lempert (Purdue University),

Analytic sheaves in Banach spaces.

Abstract: We introduce a class of analytic sheaves in a Banach space X, that we shall call cohesive sheaves. Cohesion is meant to generalize the notion of coherence from finite dimensional analysis. Accordingly, an analog of Cartan's Theorems A and B holds for cohesive sheaves on pseudoconvex open subsets $\Omega \subset X$, provided X has a so called unconditional basis. The results are joint with Imre Patyi.

Jeffery McNeal (Ohio State University),

Global regularity of the $\overline{\partial}$- Neumann problem and plurisubharmonicity conditions.

Abstract: I will review the basic problem of estimating derivatives in the $\bar{\partial}$-Neumann problem. A theorem of Boas and Straube shows that derivatives of $(0, 1)$-forms can be estimated, appropriately, on smoothly bounded domains whose boundary is defined by a plurisubharmonic function. On the other hand, a theorem of Christ shows that derivatives cannot by estimated when the domain is only pseudoconvex. I will give a new proof of the Boas-Straube theorem, which sheds a different light on the role of plurisubharmonicity and also extends to higher level forms.

Detlef Müller (Christian Albrecht Universität Kiel),

A necessary condition for local solvability of linear differential operators with double characteristics.

Abstract: Consider a linear differential operator L with smooth coefficients defined, say, in an open set $\Omega \subset \mathbb{R}^n$. Assume the principal symbol p_k of L vanishes to second order at $(x_0, \xi_0) \in T^*\Omega \setminus 0$, and denote by $Q_{\mathcal{H}}$ the Hessian form associated to p_k on $T_{(x_0,\xi_0)}T^*\Omega$. The main result I am going to present states that (under some rank conditions and some mild additional conditions) a necessary condition for local solvability of L at x_0 is the existence of some $\theta \in \mathbb{R}$ such that $\mathrm{Re}\,(e^{i\theta}Q_{\mathcal{H}}) \geq 0$. By means of Hörmander's classical necessary condition for local solvability, the proof is reduced to the following question:

Suppose that Q_A and Q_B are two real quadratic forms on a finite dimensional symplectic vector space, and let $Q_C := \{Q_A, Q_B\}$ be given by the Poisson bracket of Q_A and Q_B. Then Q_C is again a quadratic form, and we may ask: When can we find a common zero of Q_A and Q_B at which Q_C does not vanish?

Joaquim Ortega-Cerdà (University of Barcelona),

Marcinkiewicz-Zygmund inequalities.

Abstract: I will present some joint work with Jordi Saludes and Jordi Marzo. We study a generalization of the classical Marcinkiewicz-Zygmund inequalities. We relate this problem to the sampling sequences in the Paley-Wiener space and by using this analogy we give sharp necessary and sufficient computable conditions for a family of points to satisfy the Marcinkiewicz-Zygmund inequalities. We also deal with some generalization in higher dimensions.

Evgeny Poletsky (University of Syracuse),

Composition operators on hyperconvex domains.

Abstract: In the talk we will present recent results of our joint work with Michael Stessin about composition operators on hyperconvex domains. The main goal is to determine where and how composition operators map Hardy and Bergman spaces. The plan of the talk:

1. The definitions of Hardy and Bergman spaces on hyperconvex domains and their properties.
2. Composition operators for mappings from hyperconvex domains into strongly pseudoconvex domains.
3. The Nevanlinna counting function on hyperconvex domains and its properties.
4. Characterization of bounded and compact composition operators in terms of the Nevanlinna counting function on hyperconvex domains.
5. Composition operators for mappings from hyperconvex domains into the unit disk.

Linda Rothschild (University of California, San Diego),

Images of real submanifolds under finite holomorphic mappings.

Fulvio Ricci (Scuola Normale Superiore, Pisa, Italy),

Analysis of Hodge Laplacians on the Heisenberg group.

Abstract: In this joint work with D. Müller and M. Peloso, we decompose the space of L^2-differential k-forms on the Heisenberg group under the action of the $U(n)$-invariant riemannian Hodge Laplacian. Modulo unitary equivalence, the action on each component coincides with that of an appropriate $U(n)$-invariant differential or pseudo-differential operator acting on functions. This allows to obtain an Mihlin-Hörmander L^p-multiplier theorem for Hodge Laplacians.

Mei-Chi Shaw (University of Notre Dame),

Bounded plurisubharmonic functions and the $\bar{\partial}$-Cauchy problem in the complex projective spaces.

Abstract: In this talk we will discuss bounded plurisubharmonic functions on pseudoconvex domains in the complex projective spaces. Such functions are used to study function theory via the $\bar{\partial}$-Cauchy problem. We also discuss the applications on the nonexistence of Levi-flat hypersurfaces in the complex projective spaces.

Berit Stensones (University of Michigan).

Plurisubharmonic polynomials in two variables.

Abstract: This is joint work with Gautam Bharali. We are studying homogeneous plurisubharmonic polynomials in two complex variables and show that generically they can be "bumped" to their order of vanishing.

Edgar Lee Stout (University of Washington),

The Complex Analysis of Patrick Ahern, of Alexander Nagel, and of Jean-Pierre Rosay.

Elias M. Stein (Princeton University),

Pseudo-differential and singular integral operators in complex analysis.

Abstract: A discussion of the background and some recent results in the study of algebras of pseudo-differential and singular integral operators related to analysis in several complex variables, with emphasis on the contributions of Alex Nagel.

Dror Varolin (State University of New York - Stony Brook),

L^2 *extension from smooth hypersurfaces with non-trivial normal bundle.*

Abstract: We discuss a new result on L^2 extension of twisted canonical sections from a smooth complex hypersurface. We then apply this result, using a method initiated by Y.-T. Siu and simplified by M. Paun, to obtain an extension theorem for twisted pluricanonical sections.

Sidney M. Webster (University of Chicago),

CR geometry and the sublaplacian.

Abstract: This is an on going program to construct a Folland-Stein parametrix based on an Hadamard construction somewhat different from that of Beals-Gaveau-Greiner. We begin in the subriemannian case, but soon find the need for the (almost) CR-structure, as the accuracy is increased.